

ZOOLOGY.—*A new fairy shrimp from western United States, with notes on other North American species.* RALPH W. DEXTER, Kent State University, Kent, Ohio. (Communicated by Fenner A. Chace, Jr.).

Recent studies on the fairy shrimps (Crustacea; Anostraca) of North America have brought to light some new and interesting records worthy of publication. One new species collected from Nevada, Washington, and California is described. The known geographic range of nine species is extended considerably by the acquisition of some new locality records. Additional records of two species of fairy shrimps living in the same pond are given and the seasonal occurrences of *Eubbranchipus serratus* and *E. vernalis* in certain ponds studied in east central Illinois during the spring seasons of 1951–1955 inclusive are outlined in detail. This report continues the studies published in an earlier paper (Dexter, 1953).

Specimens of Anostraca collected by Robert S. Bray which are mentioned in this paper were sent to the writer by Dr. Folke Linder of Sweden. Specimens sent from the U. S. National Museum were obtained through the courtesy of Dr. Fenner A. Chace, Jr., curator of the Division of Marine Invertebrates. To these men and to the others named below who contributed specimens for this work my heartiest thanks are given.

Family BRANCHINECTIDAE

Branchinecta mackini, n. sp.

MALE (Figs. 1–4): Total body length, including cercopods, 16–25 mm. First antennae 4.5 mm. Second antennae 8.0 mm, consisting of two articles of equal length. Proximal article contains at its base a spur 0.4 mm long with minute spinules on it. Near the lower end of the same article are 3 or 4 inconspicuous spines well spaced along the lower medial surface. The distal article is gently curved, somewhat flattened, and the end is not recurved. There is no antennal appendage and no frontal appendage. Eye stalk 0.8 mm in total length. Penes 1.0 mm in length with a process 0.2 mm long and two swollen, spinous areas near the tip. There are seven postgenital segments. Cercopods are 2.0 mm in total length, gradually taper to a sharp point, and are fringed

with setae 0.2–0.4 mm long. Swimming appendages are 2.5–4.0 mm long, with one proepipodite and one epipodite.

FEMALE (Figs. 5, 6): Total length, including cercopods, 16–25 mm. First antennae 3.2 mm. Second antennae 1.3 mm in length, swollen with a short, sharp point at the end. Eye stalk 0.8 mm in total length. Ovisac 6.5 mm in total length; 1.3 mm in greatest diameter. There are seven postgenital segments. Cercopods and thoracic swimming appendages are like the male.

This species resembles most closely *Branchinecta shantzi* Mackin, 1952. However, *B. mackini* has a pointed spur at the base of the second antennae of the male instead of a rounded knob, the spines along the medial margin are not concentrated and are not on a swollen prominence, and the tips of the male antennae are not recurved as they are in *B. shantzi*.

Specimens were collected by Dr. Ira La Rivers from a playa pond 15 miles north of Reno in Washoe County, Nev., on February 16 and June 9, 1940 (eight males and two females, seven males and one female, respectively), and again from a playa pond south-southeast of East McNett Place, Fish Lake Valley in Esmeralda County, Nev., on March 26, 1951. Seven males and 14 females were collected at that time from which the holotype and allotype have been selected. Dr. R. H. Whittaker and his student C. W. Fairbanks collected many specimens from a large shallow pond some 40–50 hectares in area at Alkali Lake, Grand Coulee, Wash., on May 15, 1949. Dr. Arthur S. Lockley collected some from Bicycle Dry Lake near Barstow, Calif., in November 1955.

This new species has been named for Dr. J. G. Mackin, who first called its attention to the writer and who has made the most thorough study and revision of the genus *Branchinecta* in North America. The male holotype and the female allotype have been deposited in the U. S. National Museum (nos. 99216 and 99217). Paratypes have been divided among that institution (no. 99218), Dr. J. G. Mackin, Dr. Ira La Rivers, Dr. N. T. Mattox, Dr. R. H. Whittaker, and the writer.

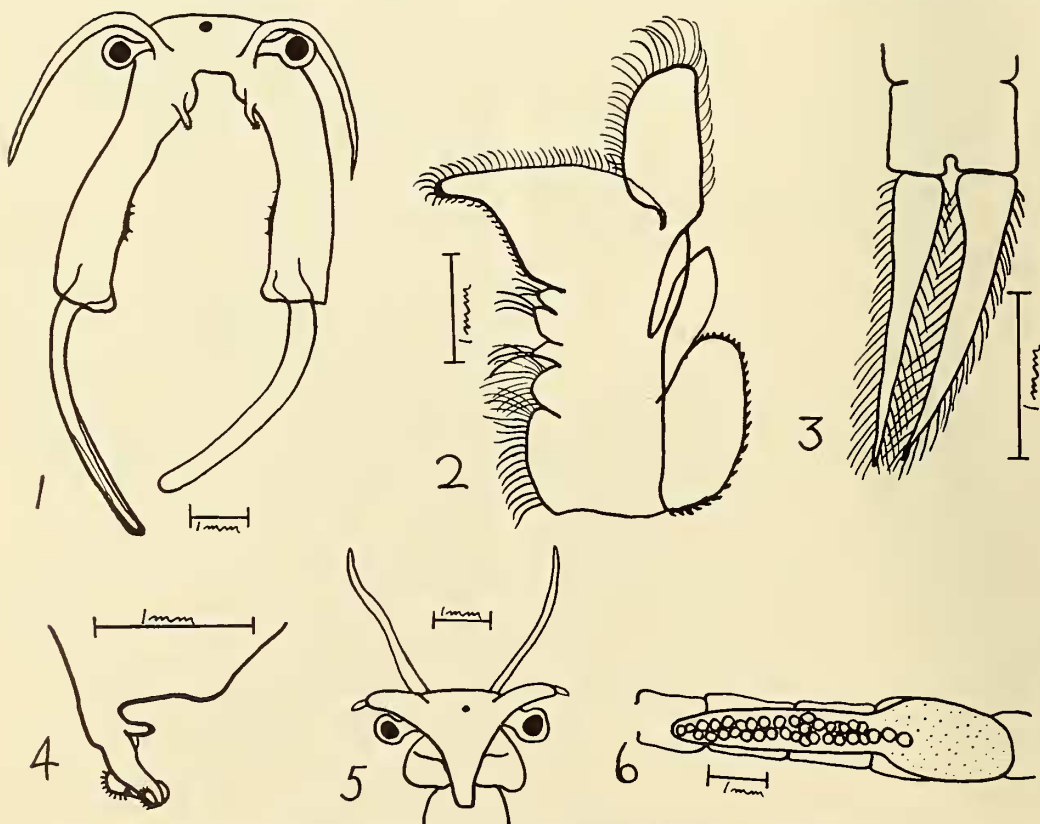
NEW RECORDS OF GEOGRAPHICAL
DISTRIBUTION OF ANOSTRACA

Since the publication of my previous paper outlining the known geographical distribution of certain species of fairy shrimps in North America, some new field records have come to hand which extend the known range of nine species and give additional locality data on some uncommon species.

The distribution of *Polyartemiella hazeni* (Murdock) has usually been given in the literature in very general terms as "the coastal plains of Alaska and Yukon Territory." Few specific records on those plains have ever been published. For that reason two which have come to hand recently are given here. Dr. N. T. Mattox sent some specimens of this species that had been collected by Roy Robinson near the Meade River at Point Barrow, Alaska, on August 15, 1952. Lawrence C. Bliss collected for the writer about 50 specimens of this species from depressed

polygons on the coastal plain of Alaska at lat. $70^{\circ} 25' N.$, long. $150^{\circ} 40' W.$, on August 6, 1953. This locality is about 18 miles south of the Arctic Ocean and about one-quarter of a mile east of the Colville River. The polygons, formed by ice action, were about 2-4 feet deep, for the most part, and had an average diameter of 10-20 feet. Specimens were collected from six of them, and many of the animals observed were in copulation at the time. The polygons do not dry out as do temporary ponds in the temperate belt, but they do freeze to the bottom. Thus, the eggs of fairy shrimps are just as effectively removed from free water, a condition which usually seems to be necessary before they will hatch in any quantity. The name of this species was misspelled as *P. hanseni* by Daday, in 1910, and copied by most North American writers ever since. The correct spelling is *P. hazeni*.

Recently, specimens of another arctic species seldom collected have come to hand. Ten specimens of *Artemiopsis stefanssoni* Johansen were



FIGS. 1-6.—*Branchinecta mackini*, n.sp.: 1, Head of male; 2, swimming appendage of male; 3, cercopods of male; 4, penis; 5, head of female; 6, egg sac.

collected from a lake 3 miles north of Mound Bay Weather Station, Prince Patrick Island, in Northwest Territory, Canada.

Thamnocephalus platyurus Packard is now known from Utah, Nebraska, and Missouri. Specimens of the former two were sent from the U. S. National Museum. Two males and four females were collected from an impoundment of fresh-water at Monument Valley, Utah, by Marvin Walter on August 10, 1952. A single female specimen was collected by Dr. H. W. Manter from the western part of Nebraska. Date and locality were not recorded. Also, from the National Museum were sent specimens which are the second State record from Nevada, the first having been published in my previous paper. Two females were collected from near Dry Lake, 6 miles west of Boulder City, on October 29, 1952, by Mrs. V. B. Vehling. One specimen measured 28 mm in total length. Dr. Ira La Rivers sent another lot of two females collected from the same region. One of his students, E. A. Carl, found them at "Dry Lake, 4 miles south of the railroad pass between Las Vegas and Boulder City, Clark County, on September 17, 1953." The first records from Missouri were sent by Dr. Peter W. Frank, of the University of Missouri. He and one of his students, Robert W. Kelly, collected *T. platyurus* in July 1954 and from June to September 1955. They were collected from more than 15 temporary pools on the north bank of the Missouri River flood plain between Jefferson City and Booneville, and they were much more abundant during the latter year.

Eubranchipus vernalis (Verrill) has been found in Delaware, Maryland, and Virginia for the first time. R. S. Bray collected this species in Newcastle County, Del., on December 29, 1940. He also found it in a barnyard at Yellow Springs, Md., on December 14, 1940, and in Loudoun County, Va., on March 2, 1942. The occurrence of this species from Kentucky, inadvertently omitted from my earlier report, seems to rest solely upon an early record (1874) from near Covington. Additional records have recently come to the attention of the writer. Dr. Gerald A. Cole, of the University of Kentucky, collected *E. vernalis* between 1950 and 1954 from seven temporary pools and one permanent pond, which has dry margins annually, in various parts of Jefferson County. For the most part these pools were formed by flood waters of the Ohio River.

In 1955 the water level was so high that these pools were washed over by the flood waters of the river, which carried away any pond fauna that had developed by early spring.

Eubranchipus neglectus Garman was described from Kentucky. The U. S. National Museum has eight specimens of *E. neglectus* collected from a clay pit near New Philadelphia, Ohio, by Dr. Victor Sterki. No date was recorded. Identification was made by Dr. E. P. Creaser and Dr. Folke Linder. This record extends the known range to eastern Ohio.

Eubranchipus serratus Forbes is now reported from Virginia and Maryland for the first time, and the second record from Indiana and Montana are listed. R. S. Bray collected this species on December 15, 1940, at Daday's Pond in Loudoun County, Va. A second lot was collected on April 5, 1941, from a cornfield pond near Seneca, Md. Dr. R. B. Brunson obtained the second record of this species from Montana with specimens he collected from Union Creek on April 17, 1951, and from a pond near Kicking Horse Reservoir on April 23, 1951. Identifications were made by Dr. N. T. Mattox, who sent the records to the writer. The first record from Indiana was recently published (Dexter, 1953). The second one from this State was made by Dr. Clarence Goodnight, who found this species in a gravel pit near West Lafayette in April 1953. Although most of the specimens received from him were mature, they were smaller than usual in size, averaging only 12 mm in total length. Dr. Mattox noted that the specimens from Montana were also smaller than average. It has been the experience of the writer to find that fairy shrimps vary greatly in size, not only in different geographic localities and during different years, but also in the same general locality at the same time.

Eubranchipus holmani (Ryder) has been collected in Maryland for the first time by R. S. Bray. Two males and two females were found at Martinsburg on April 16, 1940. A single male was taken from a barnyard pond at Yellow Springs on December 14, the same year, and two males and four females were collected in the Sunday Swamps at Bear Island on March 22, 28, and May 14, 1941. In my previous paper I overlooked an old published record of this species from Pennsylvania and from Minnesota. These States should now be added to the list.

Artemia salina (Linnaeus) is usually found in saline lakes and evaporating basins. Only rarely

is it found in temporary pools. However, Ernest J. Roscoe collected specimens from a temporary pool northwest of Granite Mountain in Tooele County, Utah, on October 6, 1953. Recently this species was reported from Saskatchewan for the first time (Moore, J. E. 1952). It was found in abundance in Little Manitou, a saline lake.

Branchinecta shantzi Mackin is now reported for the first time from Nevada. Dr. Ira La Rivers collected 10 females and 8 males from railroad playa northwest of White Mountain in Washoe County on May 16, 1940.

Branchinecta coloradensis Packard, formerly known quite generally as *B. lindahli* until the genus was revised by Mackin (1952), is now known from Washington, California, and Utah. Dr. R. M. Bond obtained a large number of specimens, not quite mature, from a pool on the east side of the Columbia River, $2\frac{1}{2}$ miles northeast of Vantage Bridge in Washington, on March 26, 1937. Dr. Ira La Rivers collected *B. coloradensis* on July 23, 1953, at upper Convict Creek basin in Mono Co., Calif., some 35 miles north of Bishop. Abundant specimens were found in several temporary meadow pools, formed from melting snow. The water temperature at the time of collecting, however, was 24°C. These pools are on the eastern slope drainage near the crest of the southern Sierras at an elevation of 10,300 feet. By August 13 all but the largest one had dried out. Records of this species collected by Dr. La Rivers and T. J. Trelease from Marble Butte in Nevada published in my previous paper did not include the dates. The dates of collecting were March 31 and April 23, 1949. The first Utah collection of *B. coloradensis* was made by Nyvin Marchette on April 19, 1954, from a temporary pond in Government Creek Valley, Tooele County. These were sent to me through the courtesy of Ernest J. Roscoe. Dr. Elizabeth McClintock obtained the second record of this species from Arizona by collecting specimens from temporary pools in red sandstone rocks in Toroweap Valley of Mohave County about 1 mile from the rim of the Grand Canyon, on May 6, 1952.

Two errors that have appeared in recent literature concerning *Branchinecta lindahli* should be corrected. First, W. G. Moore (1950) published a record of *B. coloradensis* from Texas that should have been designated as *B. lindahli* through an error on the part of the writer. Specimens sent by Dr. Moore were identified

before the revision of the genus by Mackin (1952), and a misinterpretation led to an incorrect diagnosis. Secondly, in Mackin's revision (ibid.) of *Branchinecta*, the species *B. lindahli* Daday, 1910, is cited as a synonym of *B. lindahli* Packard 1883, whereas it should be listed in the "non" group. It is unfortunate that so much confusion has developed in the published literature on this genus in North America to continually plague students of the group since the genus was first found here.

Streptocephalus texanus Packard is now reported from Montana and Missouri. It was collected for the first time in Montana by H. E. Nelson, who found specimens at Glasgow in May 1952. This represents the most northerly locality from which the species has been recorded to date. This record, and the one of *S. seali* from Montana mentioned below, were brought to my attention by Dr. Mattox, who had received specimens for study from Dr. R. B. Brunson. Dr. Peter Frank and his student Robert Kelly have collected *S. texanus* from temporary pools along the north bank of the Missouri River near Booneville, Mo., in recent years. Specimens without field data were examined by the writer.

Streptocephalus seali Ryder is now recorded from North Carolina, Maryland, Missouri, Montana, and California for the first time. The U. S. National Museum contains specimens of *S. seali* collected by S. F. Hildebrand on June 3, 1926, from Thomas Pond No. 3 at Beaufort, N. C. R. S. Bray collected specimens from Bear Island, Md., on November 16, 21, and 28, and December 5, 1937, and again on August 6 and September 2, 1938. Dr. James Kezer, formerly at the University of Missouri, sent numerous mature specimens, 28-30 mm in length, which he collected in the fall of 1952 from a mud hole not far from the Missouri River near Booneville, Mo. They were still living in the pool on November 10. The water was clouded with mud and as a consequence the fairy shrimps were colorless. This relationship has been observed by the writer for several species of Anostraca. Late in October 1953 and in the latter part of March 1954, Dr. Kezer again found *S. seali* in the same mud hole. Dr. Peter Frank and Robert Kelly subsequently found the same species in many ponds of various types in the area. Dr. N. T. Mattox sent a record of *S. seali* collected from Glasgow, Mont., in May 1952 by H. E. Nelson. In the collections of the U. S. National Museum

there are specimens of this species collected in September 1930 from a pond in the Sierra Nevada at an elevation of about 9,000 feet. The locality was in Tuolumne County, Calif., and the collector was R. Innis Bromley. Dr. Mattox has sent a record of *S. seali* collected by Dr. R. E. Smith from Eldorado County, Calif., on July 11, 1936. Dr. Douglas M. Whitaker has collected this species from the same county. On September 4, 1952, he found many specimens in a temporary pool filled from melted snow at an elevation of 6,600 feet in the Sierra Nevada of Eldorado County. The pond is located approximately half a mile east of Fallen Leaf Lake and about 4 miles south of the southeastern end of Lake Tahoe. Usually this pond dries out late in summer or early in fall, but heavy snows of the preceding winter caused it to persist through the season of 1952. Four male specimens ranged in size from 30 to 36 mm, with an average of 34 mm. In my previous paper I overlooked an early published record of this species from the State of New York, which should now be added to the list of known State records.

ADDITIONAL RECORDS OF COLLECTING TWO SPECIES OF ANOSTRACA TOGETHER

More records of finding two species of fairy shrimps in the same pond have come to hand. The 12 specimens of *Eubbranchipus vernalis* and the single one of *E. holmani* collected at Yellow Springs, Md., as mentioned earlier in this paper, were found together. The specimens of *Streptocephalus seali* and *S. texanus* mentioned earlier from Glasgow, Mont., were together in the same vial and had a common label so that presumably they were found together. Likewise, specimens of these same two species reported above from Booneville, Mo., have been collected together. The writer collected *Eubbranchipus vernalis* and *Chirocephalopsis bundyi* together in another locality of northeastern Ohio. They were found in a button-bush swamp pond near Mogadore in Portage County on April 27, 1952. The following year this pond did not fill with water, but in 1954 enough water accumulated to hatch out a few of each species. In the spring of 1955 there was an abundance of both species living together. The ratio, as determined by a count of 251 males, was 1 *E. vernalis*:1.5 *C. bundyi*. In a collection of fairy shrimps made by Walter Hintz near Pokagon State Park some 5 miles from Angola, Ind., there were 23 males of *E. ver-*

nalis and 8 males of *C. bundyi*. They were found together on April 16, 1954, in a pasture pond. On March 17, 1952, a single specimen of *E. serratus*, 26 mm in length, was collected by the writer with 11 specimens of *E. vernalis* in a pool on the flood plain of the Salt Fork River near Homer, Ill. *E. vernalis* is the only species previously collected in this pond and in two others nearby, but all other ponds sampled in this section of Illinois have contained *E. serratus* as the common species (Dexter, 1953). Lawrence C. Bliss collected *Branchinecta shantzi* and *Chirocephalopsis bundyi* together from a small morainal pond at an elevation of 9,900 feet in the Medicine Bow Mountains of Wyoming on June 23, 1955. These species were found separately in three other ponds in this area (two with the former and one with the latter). Dr. Peter Frank and his associates have collected *S. seali* and *Thamnocephalus platyurus* together in pools near Booneville, Mo. Dr. A. S. Lockley at the Los Angeles State College collected *T. platyurus* along with specimens that proved to be the new species *Branchinecta mackini* described in this paper. They were taken from Bicycle Dry Lake, near Barstow, Calif., in November 1955.

FAIRY-SHRIMP POPULATIONS STUDIED IN ILLINOIS, 1951-1955

After my previous report on observations of fairy-shrimp populations in east-central Illinois was published, this field study was limited to six of the ponds which had been studied earlier. One new station was added in 1953. Table 1 gives a résumé of observations made in the third week of March for the years 1951-55, inclusive. No visits were made in 1954, but residents in the area reported a very dry spring during which time the temporary pools contained no water. It can be assumed that fairy shrimps did not hatch in these stations during 1954 for lack of water. The following year conditions for fairy shrimps were only slightly better.

In addition to the five temporary pools and one permanent pond (no. 8, near Urbana) sampled in 1951, Miss Sarah A. Joyner found three ponds 6 miles northeast of Urbana which were inhabited that spring by fairy shrimps. One was a permanent woodland pond in Trelease Woods, another was a permanent grassland pond, and the third a temporary pool, the latter two situated in nearby Trelease Grassland. The two permanent ponds have a dry margin during

the summer season, which is always found in such bodies of water which contain fairy shrimps. Samples of fairy shrimps were collected by Miss Joyner in all three during the spring of 1951. She collected mature specimens of *Eubbranchipus serratus*, identified by the writer, on March 8, 1951, from the permanent grassland pond.

In 1951 the collections were made on March 21 from five selected stations chosen from those formerly studied. Specimens were obtained from under a cover of ice. Two days later another collection was made after the ponds had thawed. The populations sampled that year were small. However, during the next two years they increased in number each year for the most part. Those records showing a wide range of sizes undoubtedly represent more than one hatching brood as the result of rising water levels with each new rain. The collections of 1952 were taken from under a skim of ice which coated most of the ponds. That year, one pool on the flood plain of the Salt Fork River near Homer yielded one specimen of *E. serratus* as well as its usual population of *E. vernalis*.

In spite of the fact that pond no. 8 near Urbana was bulldozed to a depth of 11 feet during the summer of 1951, fairy shrimps hatched in abundance the following spring. Apparently many eggs were left still exposed at the surface although great quantities of eggs must have been buried deeply by the earth-moving operations. By the next year, however, game fish had been introduced into this pond, and fairy shrimps were not found there again.

The season of 1953 was a favorable one for fairy shrimps. A new pond adjacent to the one at Oakwood was sampled for the first time. In the spring of 1954 water was not known to collect in any of the temporary pools under observation because of a severe drought in the area. (The same situation was reported by Dr. James Kezer

for the region of Columbia, Mo. Ralph W. Stark found a similar situation in Boone County, Ind., until March 19, when rain broke the drought. On March 28 a heavy rainstorm there filled the pools bringing out a hatch of *E. vernalis*. In Portage County, Ohio, the writer was not able to collect fairy shrimps in some of the stations under observation until the middle of April, when rain filled many of the depressions for the first time that year. Studies on fairy shrimps in Ohio will be reported in a separate paper.)

In 1955 dry conditions still prevailed in Illinois. One pool (no. 2 near Oakwood) had 4 inches of water when examined, but no metanauplii were found in the plankton sample taken. Pond 7 near Urbana, however, had sufficient water to bring out a good-sized population of *E. serratus*.

In 1951 the sex ratio of *E. serratus* determined by a sample of 204 individuals was 1 male:1.2 females. The following year a reverse ratio of 1 male:0.6 female was found in a sample of 162 individuals. Dexter and Kuehnle (1951) found males of *E. vernalis* to predominate (1:0.8) in two of the counties in Ohio sampled, while females predominated in two other counties (1:1.5). Coopey (1950) found the sex ratio of *E. oregonus* to change markedly during the season as the males died off at a much greater rate. W. G. Moore (1955), on the other hand, found a balanced ratio of approximately 1:1 throughout the season in populations of *Strep-tocephalus seali* he studied in Louisiana.

SUMMARY AND CONCLUSIONS

1. *Branchinecta mackini*, n.sp., is described from specimens collected in Nevada, Washington, and California.

2. The known geographic range of the following species is extended by recent collections: *Thamnocephalus platyurus*, *Eubbranchipus vernalis*, *E. neglectus*, *E. serratus*, *E. holmani*, *Branchi-*

TABLE 1.—COLLECTING RECORDS OF ANOSTRACA IN EAST-CENTRAL ILLINOIS

Location of ponds	Pond No.	1951	1952	1953	1955
Near Oakwood-Field ditch.....	1	S, 9-30.5	C, 13-23	A, 2-20	Dry
Near Oakwood-Field ditch.....	2	—	—	N, 13-22	0, nearly dry
Near Homer-Flood plain pool.....	2	S #, 9-24.5	R, 26; S #, 22-27	N #, 4.5-9.5	Dry
Near Homer-Flood plain pool.....	3	0	0	0	Dry
Near Urbana-Pasture pool.....	7	S, 5-16.5	C, 9-29.5	N, 9-21	N, 8.5-12
Near Urbana-Pasture pool.....	8	N, 16-30	A, 17-27	0 (fish intro.)	—
Near Urbana-Pasture pool.....	9	S, 4.5-23	Destroyed	—	—

Relative abundance is indicated as follows: A—abundant; C—common; N—numerous; S—scarce; R—rare; #—*Eubbranchipus vernalis*. All other records are for *E. serratus*. Beside the symbol for abundance is given the range in size expressed in millimeters on date of collection.

necta shantzi, *B. coloradensis*, *Streptocephalus texanus*, *S. seali*.

3. New localities with notes on habitats are given for *Polyartemiella hazeni*, *Artemiopsis stefanssoni*, *Artemia salina*.

4. New records are cited for finding the following species living together in the same pond: *Eubranchipus vernalis* with *E. holmani*; *Streptocephalus seali* with *S. texanus*; *E. vernalis* with *Chircecephalopsis bundyi*; *E. vernalis* with *E. serratus*; *Branchinecta shantzi* with *C. bundyi*; *S. seali* with *Thamnocephalus platyurus*; *T. platyurus* with *B. mackini*.

5. Fairy-shrimp populations studied in seven pools in east-central Illinois during March 1951–55 are reviewed. Two species were collected: *E. serratus* which was common in most cases and *E. vernalis* which was uncommon and found in a single pool. Insufficient rainfall in the spring of 1954 prevented a hatch that season, and in the following spring only one pool had enough water to support a population. The years 1952 and 1953 were favorable ones for the fairy shrimps. Sex

ratio of *E. serratus* was 1 male:1.2 females in 1951 and 1 male:0.6 female in 1952.

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NOTES AND NEWS

A SONIC TECHNIQUE FOR TESTING LEATHER

A nondestructive method for testing leather, based on the transmission of sound waves, has recently been developed by the National Bureau of Standards. The chief instrument employed is a pulse propagation meter which measures and records the speed of a generated sound pulse through the leather. As a result, the specimen under test is left unharmed, in contrast to the tearing or other destructive effects of existing test procedures.

The experiments¹ carried out at the Bureau have shown that the velocity of sound transmission in leather varies substantially with changes in chemical and physical structure and, particularly, in fiber orientation. Velocity measurements, accordingly, are indicative of modifications of the fibrous order produced by strain, aging, and impregnating material. The study that supports these conclusions was sponsored by the Office of the Quartermaster General, Department of the

Army, and was conducted by Joseph R. Kanagy and Myron Robinson, of the NBS staff.

In recent years the use of sonic techniques to determine certain mechanical properties of high polymers has become widespread. Such methods have employed frequencies ranging from less than 1 cps up to several megacycles. The use of a single frequency throughout a series of tests readily permits mathematical analysis of the data and determination of the physical constants characteristic of the viscoelastic behavior of the material. Besides furnishing a means for securing fundamental information, sonic methods have been successfully utilized in nondestructive testing. These applications relate mainly to the location of flaws in a variety of manufactured products.

The investigations of the NBS leather laboratory are part of a larger program of fundamental and applied research on natural and synthetic polymers—rubber, plastics, textiles, leathers, and papers. This program seeks not only to improve present basic knowledge of high polymers but also to make possible their more effective utilization in commercial products. The present study of the potentialities of sound-transmission measurements is expected to provide the basis for im-

¹ For further technical details see *Studies on leather by means of a sonic technique*, by J. R. KANAGY and M. ROBINSON, Journ. Amer. Leather Chem. Assoc. (in press).